a.) Listing of Claims

1. (original) A liquid level detector comprising
a detector body,
a damping element,
an acoustical-electrical transducer comprising
a transducer membrane, and
a transducer body coupled to the detector body by the damping element,
a sleeve with an opening,
an acoustic waveguide coupled to the detector body by the sleeve and comprising
a tube or tubes,
reflectors,
a waveguide cavity, and
a waveguide inlet, and
an acoustic matching unit positioned inside the sleeve between the transducer membrane and the waveguide inlet and comprising
a diaphragm with a channel and
a cavity coupled to the waveguide cavity by the diaphragm with the channel,
the damping element providing acoustic and vibration decoupling of the transducer body and the detector body.

2. (original) The detector of Claim 1 wherein the acoustic matching unit is shaped as a cup, the diaphragm with the channel forms the base of the cup, the cavity of the cup faces the transducer membrane, and the channel of the diaphragm faces the opening of the sleeve.

3. (original) The detector of Claim 2 wherein the cavity of the cup is filled with a damping material.

4. (original) The detector of Claim 2 wherein the external surface of the cup facing the sleeve is covered with a damping material.

5. (original) The detector of Claim 2 wherein the cup comprises a bushing and the diaphragm with the channel is shaped as a washer and is separable from the bushing.

6. (original) The detector of Claim 1 wherein the volume of the cavity of the acoustic matching unit and the dimensions of the channel of the diaphragm are connected as

$$f_0 = \frac{c}{2\pi}\sqrt{\frac{S}{V \bullet L}}$$

where

f_0 is an operating frequency of the acoustical-electrical transducer,

c is the speed of sound,

S is the cross-section area of the channel of the diaphragm,

V is the volume of the cavity of the acoustical-electrical transducer, and

L is the length of the channel of the diaphragm.

7. (original) The detector of Claim 1 wherein the acoustical-electrical transducer is hermetic.

8. (original) The detector of Claim 1 wherein the tubes of the acoustic waveguide are connected to each other by adapters.

9. (original) The detector of Claim 1 wherein the reflectors comprise reflective washers located at junctures of the tubes, the internal diameter of each washer being different from the internal diameters of the joined tubes.

10. (original) The detector of Claim 1 wherein the reflectors comprise holes located along the tube or tubes.

11. (original) The detector of Claim 1 wherein the reflectors comprise rods fixed in walls of the tube or tubes.

12. (original) The detector of Claim 1 wherein the acoustical-electrical transducer comprises a cavity, the transducer body comprises a compensation hole, and the acoustic matching unit comprises a compensation hole, the compensation holes equalizing pressure between the waveguide cavity and the cavity of the acoustical-electrical transducer, and further comprising a filter opaque to moisture and permeable to gas installed in the compensation hole of the transducer body.

13. (original) A liquid level detector comprising
a detector body,
a damping element,
an acoustical-electrical transducer comprising
a transducer membrane, and
a transducer body coupled to the detector body by the damping element,
a sleeve with an opening,
an acoustic waveguide comprising
a tube or tubes,
reflectors,
a waveguide cavity, and
a waveguide inlet,
a Γ-shaped or T-shaped intermediate acoustic waveguide coupled to the detector body by the sleeve and coupled to the acoustic waveguide at an angle to a section of the intermediate waveguide coupled to the sleeve, and
an acoustic matching unit positioned inside the sleeve between the transducer membrane and the waveguide inlet and comprising

a diaphragm with a channel and

a cavity coupled to the waveguide cavity by the diaphragm with the channel,

the damping element providing acoustic and vibration decoupling of the transducer body and the detector body.

14. (original) The detector of Claim 13 wherein the acoustic matching unit is shaped as a cup, the diaphragm with the channel forms the base of the cup, the cavity of the cup faces the transducer membrane, and the channel of the diaphragm faces the opening of the sleeve.

15. (original) The detector of Claim 14 wherein the cavity of the cup is filled with a damping material.

16. (original) The detector of Claim 14 wherein the external surface of the cup facing the sleeve is covered with a damping material.

17. (original) The detector of Claim 14 wherein the cup comprises a bushing and the diaphragm with the channel is shaped as a washer and is separable from the bushing.

18. (original) The detector of Claim 13 wherein the volume of the cavity of the acoustic matching unit and the dimensions of the channel of the diaphragm are connected as

$$f_0 = \frac{c}{2\pi}\sqrt{\frac{S}{V \bullet L}}$$

where

f_0 is an operating frequency of the acoustical-electrical transducer,

c is the speed of sound,

S is the cross-section area of the channel of the diaphragm,

V is the volume of the cavity of the acoustical-electrical transducer, and
L is the length of the channel of the diaphragm.

19. (original) The detector of Claim 13 wherein the acoustical-electrical transducer is hermetic.

20. (original) The detector of Claim 13 wherein the tubes of the acoustic waveguide are connected to each other by adapters.

21. (original) The detector of Claim 13 wherein the section of the intermediate acoustic waveguide from the sleeve to the center axis of the acoustic waveguide has the length equal to the integer number of the half-wavelengths of sound in the range $(1 \div 3) \bullet \frac{c}{2f_0}$

where
f_0 is an operating frequency of the acoustical-electrical transducer, and
c is the speed of sound.

22. (original) The detector of Claim 13 further comprising a ball valve installed at the bend of the Γ-shaped or T-shaped intermediate acoustic waveguide, the valve at one position coupling the cavity of the acoustic matching unit to the waveguide cavity, and at another position connecting the waveguide cavity to the environment outside the detector.

23. (original) The detector of Claim 13 wherein the tubes of the acoustic waveguide are connected to each other by sleeve couplings.

24. (original) The detector of Claim 13 wherein the reflectors comprise reflective washers located at junctures of the tubes, the internal diameter of each washer being different from the internal diameters of the joined tubes.

25. (original) The detector of Claim 13 wherein the reflectors comprise holes located along the tube or tubes.

26. (original) The detector of Claim 13 wherein the reflectors comprise rods fixed in walls of the tube or tubes.

27. (original) The detector of Claim 13 wherein the acoustical-electrical transducer comprises a cavity, the transducer body comprises a compensation hole, and the acoustic matching unit comprises a compensation hole, the compensation holes equalizing pressure between the waveguide cavity and the cavity of the acoustical-electrical transducer, and further comprising a filter opaque to moisture and permeable to gas installed in the compensation hole of the transducer body.